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A SILURIAN (UPPER LLANDOVERY) CORAL FAUNA FROM THE  
WOLOMIN BEDS NEAR ATTUNGA, NEW SOUTH WALES

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(Plates III-V)

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*Synopsis*

Corals of Upper Llandovery age are described from two limestone lenses interbedded with cherts and jaspers of the Woolomin Beds just east of the Peel Fault System in northeastern New South Wales. New species described are *Mazaphyllum acclive*, *Laceripora dactyloides*, *Halysites stellatus*, *H. strongyloides*, *H. corrugatus* and *Densopores acanthodes*. The age of the Woolomin Beds is discussed.

INTRODUCTION

Limestones of pre-Devonian age were first recognized and located accurately in the area between the Namoi River and Moore Creek by Chappell (1961). These lenses, which crop out within or just to the east of the Peel Fault System (Fig. 1), were assigned an Ordovician-Silurian age on the basis of tabulate coral faunas occurring at L4 and L6 and mapped as part of the Woolomin Beds. Prior to Chappell's work limestones had been recorded at several localities adjacent to the Peel Fault System, but their stratigraphic relationships and ages were not known. Benson (1917: 695) described lenticular masses of limestone east of the Peel Fault amongst crushed and sheared cherts, agglomerates and volcanic breccias which he called the "Eastern Series". No specific localities were given and these limestones were mapped as part of the "Nemingha limestone horizon" in the Tamworth Group, which Benson traced north from the valley of The Horse Arm Creek to Crow Mountain. Carne and Jones (1919) described the lenses recorded as L1, L7, L8, and L9 by Chappell (1961) and placed them in the Devonian.

This paper describes coral faunas from two limestone lenses within the Woolomin Beds (Lens 4 and part of Lens 6 of Chappell); the age of the faunas is Upper Llandovery. This is the first fauna from the Woolomin Beds whose age has been reasonably established. Whether this is an accurate age for the enclosing sediments of the Woolomin Beds is still uncertain because of a possible allochthonous origin for the limestones. No graptolites have so far been found in the Woolomin Beds.

The material described in this paper is lodged in the fossil collections, at the Geology Department, University of New England, Armidale (subsequently abbreviated UNE F). The locality numbers refer to the catalogue of localities maintained in the same Department as follows: Locality 451 (Chappell's L4 on Figure 1) and Locality 841 (the southern part of Chappell's L6 on Figure 1; for numbering of individual lenses at this latter locality see Hall, 1975: Fig. 1).

THE WOLOMIN BEDS

(Benson, 1913, emend. Crook, 1961)

The lithology, distribution and nomenclature of the Woolomin Beds have been discussed by Crook (1961) and Chappell (1961).

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The Woolomin Beds in the Attunga district consist predominantly of cherts and massive red jasper bars, laced with abundant quartz veins. Masses of highly sheared serpentinite are common, presumably located along small subsidiary fault planes associated with the Peel Fault System. Small limestone lenses occur at several localities within the Woolomin Beds (Fig. 1).

A dark, fine-grained limestone with breccia patches and a high bioclastic content of corals, with crinoid and brachiopod fragments, covers an area of 150 m<sup>2</sup> at Locality 451 (Chappell's original L4). The exposure is about 50 m west of the road from Attunga to Halls Creek which follows Spring Creek, at the top of the ascent from the valley of Spring Creek (Grid Reference 915840, Attunga 1: 63,360 topographic sheet). This limestone has yielded the following fauna: *Acanthohalysites pycnoblastoides* (Etheridge); *Densoporites acanthodes*

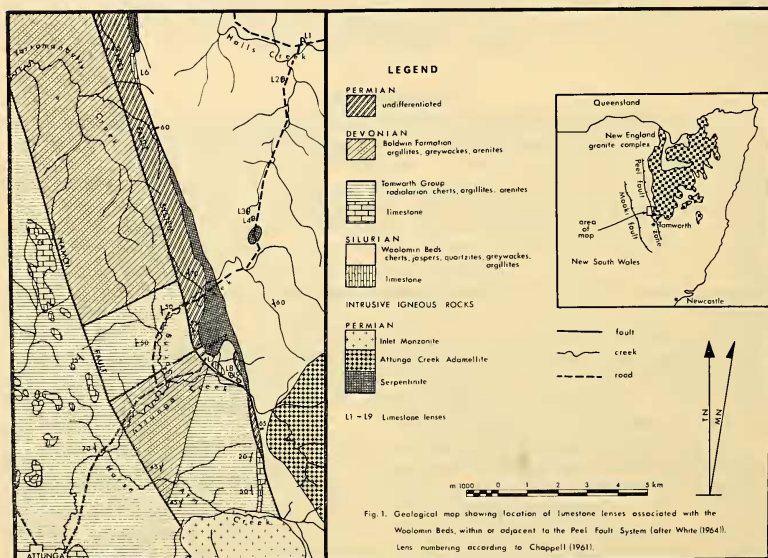


Fig. 1

sp. nov.; *Halysites eratus* Etheridge; *Halysites lithostrottonoides* Etheridge; *Halysites stronglylodes* sp. nov.; *Halysites bellulus* Hamada; *Halysites stellatus* sp. nov.; *Laceripora dactylioides* sp. nov.; *Mazaphyllum acclive* sp. nov.; *Plasmoporella* sp. cf. *P. conxerotabulata* Kiaer; *Favosites* sp. cf. *F. yassensis* Jones; *Favosites allani* Jones.

Detailed mapping at Locality 841 (Chappell's L6) by plane table has revealed numerous small limestone lenses (yielding a rich Late Ordovician coral fauna) interbedded with green cherts and pale brown mudstones; these sediments comprise a fault block within the Peel Fault System and have been described as the Uralba Beds (Hall, 1975). Immediately to the south another fault block contains cherts and jaspers of the Woolomin Beds with several small limestone lenses, one of which (Lens 0, Grid Reference 884895, Attunga 1: 63,360 topo-

graphic sheet; see Hall, 1975: Fig. 1 for accurate location) has yielded *Halysites lithostrotionoides* Etheridge and *Halysites corrugatus* n. sp.

Small lenses of schistose serpentinite occur at a number of localities within the Woolomin Beds to the east of the Peel Fault System. Chappell (1961) placed the two large serpentinite masses northeast of Attunga within the Woolomin Beds. In fact the continuous belt of rocks mapped by Chappell as part of the Woolomin Beds and lying to the west of these serpentinite masses is now shown to consist of a series of fault blocks (of Ordovician, Silurian and Permian ages) within the Peel Fault System (Fig. 1). Thus the serpentinite masses in question may be regarded as lying along a major fault plane which is undoubtedly part of the Peel Fault System proper, as is the case elsewhere in New England (for a summary of similar occurrences of serpentinite see Leitch, 1969: 29).

#### AGE OF THE FAUNA AND THE WOOLOMIN BEDS

The best known Silurian rocks in New South Wales occur in the Lachlan Geosyncline of the southern and central highlands, extending from Albury to Dubbo. Faunas of this region include both shelly and graptolitic facies, the latter providing broad correlation with the European sequence, particularly for the Late Silurian. West of Orange most of the Silurian sequence is included in the Panuara Group, near the base of which the Bridge Creek Limestone has yielded *Schedohalysites orthopetroides* (Etheridge), *Halysites cratus* Etheridge, *Heliolites* sp., *Desmidopora* sp., *Mucophyllum* sp., *Cystiphyllum* sp., *Kloedenia* sp., *Leperditia* sp., *Lambeophyllum profundum* (Conrad), *Streptelasma recisum* McLean and *Priscosolenia* (Stevens and Packham, 1953; McLean, 1974b). Graptolites of the *Monograptus gregarius* zone occur about 18 m above the Bridge Creek Limestone; a late Lower Llandovery to early Middle Llandovery age for the limestone is indicated (McLean, 1974b). Further west Packham and Stevens (1955) recognized the Quarry Creek Limestone "Member" as the basal unit of the Panuara "Formation", with the following coral fauna: *Acanthohalysites peristephesicus* (Etheridge), *A. pycnoblatooides* (Etheridge), *A. australis* (Etheridge), *Halysites sussmilchi* Etheridge, *H. lithostrotionoides* Etheridge, *H. cratus* Etheridge, *Arachnophyllum epistomoides* and *Mucophyllum crateroides* Etheridge (Etheridge, 1904: 38; 1909: 304; Sussmilch, 1907: 131). *Monograptus marri* occurs in immediately-overlying fine grained sandstones and the limestone has been placed in the Middle Llandovery (Packham and Stevens, 1955: 58); Talent *et al.* (1975: 78) suggest a late Llandovery age for the sandstone containing *M. marri*. McLean (1974c) redescribed *Micocystis endophylloides* Etheridge from this horizon and correlated it with the Rosyth Limestone "Member" (see also Walker, 1959; Packham, 1969), which forms the basal unit of the Panuara Group further to the northeast. The following corals have been described from the Rosyth Limestone: *Acanthohalysites* sp. cf. *A. pycnoblatooides* (Etheridge), *Schedohalysites orthopetroides* (Etheridge), *Heliolites daintreei* Nicholson and Etheridge, *Favosites* spp., *Coenites* sp., *Rhizophyllum* sp., *Mucophyllum* sp., *Phaulactis* sp., *Cystiphyllum* sp. and *Arachnophyllum? epistomoides* Etheridge (Walker, 1959: 42) and also *Kciophyllum attenuatum* McLean (McLean, 1974c). On the basis of conodont faunas both the Quarry Creek and Rosyth Limestones are believed to be Upper Llandovery in age (McLean, 1974b: 656).

Sherwin (1971: 211) recorded the presence of abundant colonies of *Halysites lithostrotionoides* Etheridge in Limestone A at the base of the Boree Creek Formation and correlated the limestone with the Quarry Creek Limestone; according to Sherwin this species is not known to occur any higher in the Silurian of the central west.

The coral faunas described here from limestones within the Woolomin Beds of New England show closest similarities with those from the Quarry

Creek and Rosyth Limestones of the central-west, particularly in the abundance of halysitids (*Halysites lithostrotonoides*, *H. cratus* and *Acanthohalysites pyenoblastoides* being species in common), and probably are also of Upper Llandovery age.

The type species of *Mazaphyllum* (*M. cortisjonesi* Crook) comes from strata believed to be an easterly extension of the Tanwarra Shale, the age of which has been given as Late Llandovery-Early Wenlock (Packham, 1969 : 108) or Wenlock-Ludlow (Talent *et al.*, 1975 : 87). The genus is known elsewhere in central and southern New South Wales from rocks of Wenlock and Ludlow age, above which it is said to become much rarer (Vandyke and Byrnes, 1976 : 132), and also from the Molong Limestone of Ludlow-Downton age (Sherwin, 1971 : Fig. 10). It has recently been recorded from the Pridolian of Somerset Island in the Canadian Arctic (McLean, 1976 : 298 ; Pedder, 1976 : 287). Thus *M. aeclive* n. sp. from the Woolomin Beds fauna, here dated as Upper Llandovery, may be the earliest known species.



Fig. 2. *Mazaphyllum aeclive* sp. nov.  $\times 3$ . (A) UNE F8755 (holotype), transverse section ; B) UNE F8756 (holotype), longitudinal section. From Locality 451, Woolomin Beds.

The Woolomin Beds have recently been interpreted as pelagic sediments which accumulated on the continental rise or abyssal plain and were progressively scraped off and deformed against an inner trench wall during subduction (Oversby, 1971 ; Scheibner and Glen, 1972 : 10 ; Scheibner, 1973 : 417 ; Leitch, 1975 : 142, 143). Shallow-water sediments such as the coralline limestones represented by the Ordovician Trelawney Beds (Philip, 1966 ; Hall, 1975) and the Silurian lenses described here have been variously interpreted as representing sedimentary cappings of guyots and oceanic islands now incorporated as "tectonic slices" (Scheibner, 1973 : 417), or sediments which have slumped into the trench from



a frontal arc (Scheibner and Glen, 1972 : 10) or from volcanic islands (Leitch, 1974 : 148). Such exotic blocks are known from Palaeozoic sequences elsewhere in eastern Australia (Conaghan *et al.*, 1976 : 529). Sherwin (1971: 221) reported blocks of Ordovician volcanics and limestones in the Upper Silurian-Lower Devonian Wallace Shale west of Orange ; megabreccias within the Lower Devonian Nubrigyn Formation south of Wellington contain allochthonous limestone blocks derived from adjacent shallow-water carbonate shelves and emplaced by submarine debris-flow (Conaghan *et al.*, 1976 : 527).

Association of shallow-water "reefal" limestones with cherts and jaspers of presumed deep-water origin in the Woolomin Beds suggests that these limestones may also be allochthonous megaclasts or olistoliths. Observation of possible stratigraphic discordance with, and structural deformation within, the contiguous sediments was not possible because of poor exposure. The Upper Llandovery coral faunas from the limestone blocks may, therefore, give only an approximate age for the enclosing Woolomin Beds.

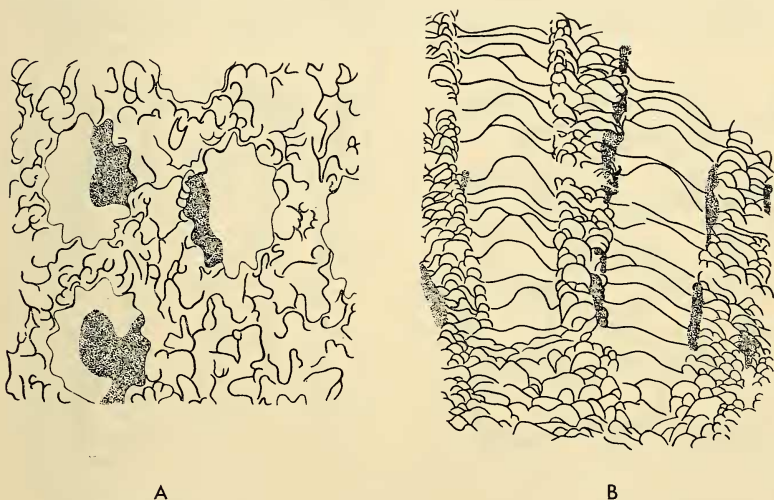


Fig. 3. *Plasmoporella* sp. cf. *P. convexotabulata* Kiaer.  $\times 4$ . (A) UNE F8736, transverse section ; (B) UNE F8734, longitudinal section. From Locality 451, Woolomin Beds.

#### SYSTEMATIC DESCRIPTIONS

Order **RUGOSA** Milne-Edwards and Haime, 1850

Suborder **Cystiphyllina** Nicholson in Nicholson and Lydekker, 1889

Family **CYSTIPHYLLIDAE** Milne-Edwards and Haime, 1850

Genus **MAZAPHYLLUM** Crook, 1955

*Type Species.* *Mazaphyllum cortisjonesi* Crook, 1955 : 1053-1056, Figs 2, 3 ; from Portion 60, Parish Turon, Country Roxburgh, N.S.W. OD.

*Diagnosis.* Plocoid Cystiphyllina, thamuasterioid, having septa, each of which consists of a single series of discrete acanthine trabeculae, which are never contiguous, and which may pierce several dissepiments. Unique among the Cystiphyllina in being plocoid (Crook, 1955 : 1052).

*Mazaphyllum acclive* sp. nov.

(Plate III a, b, c; Fig. 2)

**Name Derivation.** Latin *acclivis* = sloping upward. A reference to the inclined trabeculae making up the septa.

**Material.** Three longitudinal and two transverse sections, numbered UNE F8755-8 (designated holotype) and UNE F11790; only the thin sections remain; from Locality 451, Woolomin Beds.

**Diagnosis.** *Mazaphyllum* with narrow tabularium containing closely spaced, incomplete tabellae; septa long, about 40 in number. Layers of dissepimental tissue between corallites strongly arched.

**Description.** Corallum plocoid, thamnasterioid, consisting predominantly of layers of dissepimental tissue. Tabularia circular in cross-section and varying in diameter from 2.3 to 3.0 mm, evenly spaced at intervals of 8-10 mm.

Dissepiments flatly globose and of even height, usually between 0.7 and 0.9 mm; length 0.25-0.3 mm. Layers of dissepiments strongly arched between tabularia, but become horizontal approaching each tabularium; margins of tabularia not always distinct, dissepiments sometimes merging with tabellae.

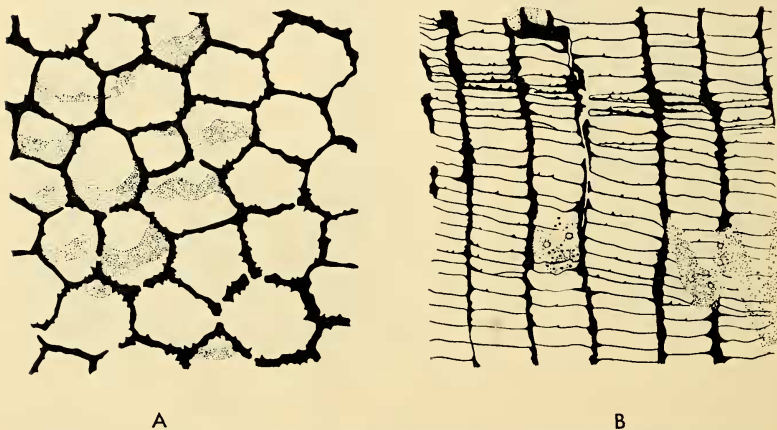


Fig. 4. *Favosites* sp. cf. *F. yassensis* Jones.  $\times 4.5$ . (A) UNE F8726/1, transverse section; (B) UNE F8726/2, longitudinal section. From Locality 451, Woolomin Beds.

Septa average 40 in number, arranged radially around each tabularium; confluent, curving between adjacent tabularia; consisting of discrete, acanthine, trabeculae 0.8 to 1.2 mm in height and 0.05 to 0.12 mm thick. Centres of individual trabeculae about 0.1 mm apart in the plane of each septum and some linked by lamellate sclerenchyme. Individual trabeculae arise from dissepimental crests, are inclined at about  $30^\circ$  from the vertical towards nearest tabularium, and may pierce several dissepiments.

The horizontal elements in the tabularia consist of very closely spaced tabellae, gently arched near the centre of the tabularium, but inclined upwards near its margin. Complete tabulae very rare.

**Remarks.** The nature of the complete corallum could not be determined from the single fragment available; because of disruption by stylolites and calcite

veins, determination of the exact number of septa was not possible. No details of fine structure are visible.

This species is quite distinct from the type species, *M. cortisjonesi* Crook which has essentially horizontal layers of dissepimental tissue, which, near the margins of tabularia, become inclined at angles of about  $30^\circ$  to the tabularial axis; in the present species these layers are strongly arched midway between tabularia, but approaching the tabularia become horizontal. Trabeculae arising from the arched zone of dissepiments are thus inclined towards the tabularia rather than being vertical as in *M. cortisjonesi*. The tabularia in the present species are smaller (reaching a maximum diameter of 3.0 mm) and the gently arched tabellae contrast strongly with the vortical arrangement of these elements in *M. cortisjonesi*.

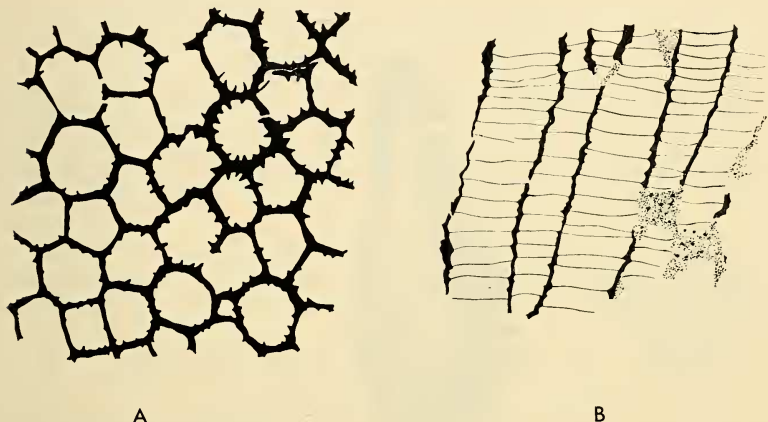


Fig. 5. *Favosites allani* Jones.  $\times 4.5$ . (A) UNE F8727/6, transverse section; (B) UNE F8732, longitudinal section. From Locality 451, Woolomin Beds.

The diameter of the tabularia, approximately horizontal arrangement of the tabellae, arching of the dissepimental layers between tabularia and inclined trabeculae of the present species are characters shared with a form recently described from the Read Bay Formation of Pridolian age on Somerset Island in the Canadian Arctic (Pedder, 1976). However, *M. acclive* differs in having longer and more strongly inclined trabeculae (inclined toward the tabularia at  $15-18^\circ$  to the vertical in longitudinal sections) which, in transverse sections, are the most conspicuous feature of the numerous septa, unlike the Canadian form.

#### Order TABULATA Milne-Edwards and Haime, 1850

Family THECIIDAE Milne-Edwards and Haime, 1849, *emend.* Sokolov, 1950

Genus LACERIPORA Eichwald, 1854

*Type Species* (by monotypy). *Laceripora cribrosa* Eichwald, 1854: 86; 1855: 3, Plate xxvi, figs 17a-d; and 1860: 490. From the Ludlovian of Estonian SSR, Saaremaa Island.

*Diagnosis.* Mural pores very numerous, septa laminar, not more than six; tabulae on same level in contiguous corallites throughout corallum (Hill and Stumm, 1956).

*Laceripora dactylioides* sp. nov.

(Plate IV, a-d : Fig. 6)

*Name Derivation.* Greek *daktylos*=finger; -oides=having the form of. Referring to the morphology of each corallum.

*Material.* A single block of limestone from Locality 451, Woolomin Beds, contained numerous coralla. Seven thin-sections were prepared, UNE F8747-53; UNE F8751 designated holotype.

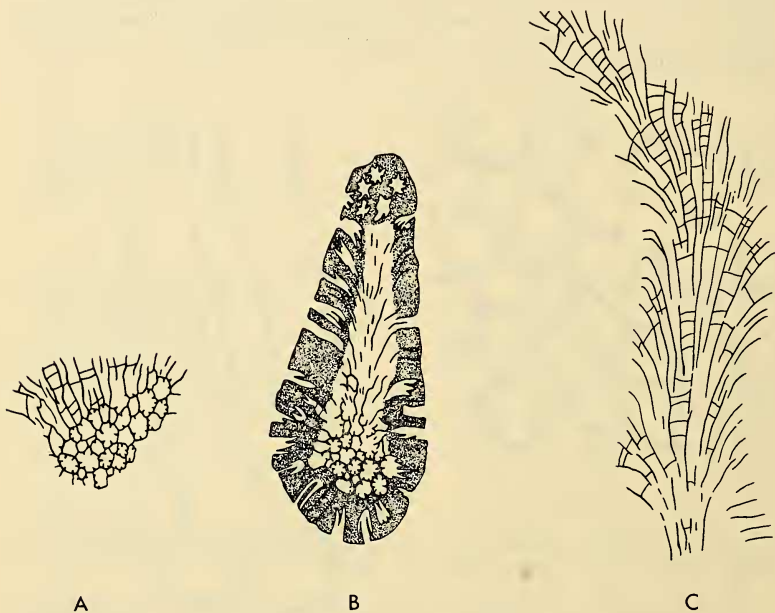


Fig. 6. *Laceripora dactylioides* sp. nov.  $\times 3$ . (A) UNE F8748 (paratype 2), transverse section; (B) UNE F8751 (holotype), oblique section; (C) UNE F8748 (paratype 2), longitudinal section. From Locality 451, Woolomin Beds.

*Diagnosis.* Corallum cylindrical, corallites slender, curving upwards and outwards from the axis to the surface of the corallum; six septa which, near the surface of the corallum, become markedly thickened to produce typically stellate appearance of corallites in transverse section. Tabulae thin, straight.

*Description.* Corallum cylindrical, typically curved, up to 3.0 cm high and 1.0 cm in width; usually broader at the base and narrowing towards the apex. Corallites in central region long, slender, parallel; distally corallites curve through  $60-80^\circ$  from the axis to open at right-angles to the corallum surface. Corallites in axial regions polygonal, varying in diameter between 0.2 and 0.6 mm with a maximum of six short, thin septa. Corallites narrow in axial region but as they curve away from axis they increase rapidly in diameter to as much as 0.8 mm, branching to produce usually two, but as many as four, new corallites.

Tabulae straight and thin, irregularly spaced at intervals varying between 0.3 and 0.6 mm; tabulae in adjacent corallites often on same level. Corallite



walls in axial region show occasional mural pores; as corallites curve away from axis and approach surface of corallum the walls and septa abruptly thicken (up to 0.3 mm) and in transverse appearance the corallites have a stellate outline.

*Remarks.* This species is characterized by the fairly consistent development of septa in axial regions, apparent scarcity of mural pores and development of a definite zone of thickening at the corallum surface. Oekentorp (1970: 161) emphasizes the branching of coralla belonging to this genus, but those of *L. dactylioides* appear as single, cylindrical colonies. Presence of septa in the unthickened axial region is a point of difference from Oekentorp's diagnosis of the genus; Dr J. Jell (*personal communication*) informs me that species of the genus from Gotland also show up to six septa in corallites of the axial region.

Family HELIOLITIDAE Lindstrom, 1876

Subfamily PLASMOPORINAE Wentzel, 1895

Genus PLASMOPORELLA Kiaer, 1897

*Type Species* (by monotypy). *Plasmoporella convexotabulata* forma *typica* Kiaer, 1899: 35; Plate V, figs. 9-11. From Etage 5 of Kiaer, Gasteropodkalk; Stravnaestangen and other localities, Norway.

*Diagnosis.* Heliolitida in which the reticulum consists of globose testae; with domed tabulae, complete or incomplete; and with discrete trabeculae throughout the tissue (Hill, 1942: 9).

*Plasmoporella convexotabulata* Kiaer, 1899

1899 *Plasmoporella convexotabulata* Kiaer; Kiaer, 1899: 35, Plate V, figs 9-11.

1942 *Plasmoporella* cf. *convexotabulata* Kiaer; Hill, 1942: 10, Plate II, fig. 9.

*Plasmoporella* sp. cf. *P. convexotabulata* Kiaer, 1899

(Plate III d, e; Fig. 3)

*Material.* Two transverse and one longitudinal section cut from three specimens, UNE F8734-6, from Locality 451, Woolomin Beds.

*Diagnosis.* *Plasmoporella* with moderately long septa, loose tissue and complete, distant, domed tabulae (Hill, 1942: 10).

*Description.* Tabularia with strongly crenulate walls, ranging in diameter from 1.9 to 2.6 mm; distances between the centres of adjacent tabularia vary between 2.5 and 6.0 mm.

Walls of tabularia range in thickness between 0.06 and 0.08 mm and have been partially silicified. Septa are represented by the inwardly directed crenulations of the walls, consistently numbering 12 in each tabularium.

Tabulae may be subhorizontal or gently arched, but more commonly are strongly arched at their centres, becoming horizontal approaching the walls; adjacent tabulae frequently anastomose. Average spacing of tabulae 10-12 in a length of 5 mm.

The tabularia are set in a coenenchyme consisting of globose dissepiments of variable form: those of narrow width (0.25 mm) are strongly arched, while others ranging up to 1.3 mm wide are flattened.

*Remarks.* This species is readily distinguished by its large and widely spaced tabularia with strongly crenulated walls lacking distinct septal spines. The pronounced upward arching in the centres of the tabulae is diagnostic. The present form differs from *P. convexotabulata* Kiaer in having septal apparatus consisting of broad undulations of the tabularial walls rather than true septa.

## Family FAVOSITIDAE Dana, 1846

## Subfamily FAVOSITINAE Dana, 1846

## Genus FAVOSTES Lamarck, 1816

*Type Species.* *Favosites gothlandicus* Lamarck, 1816 : 204 ; Silurian of Gotland. SD, Milne-Edwards and Haime, 1850 : lx.

*Diagnosis.* Corallites slender with mural pores predominantly near the middle of the walls ; short, spinose septa may be present. Tabulae complete.

*Favosites* sp. cf. *F. yassensis* Jones, 1937

(Plate IIIf, g, h ; Fig. 4)

1937 *Favosites yassensis* Jones ; Jones, 1937 : 92, Plate XIII, figs 2, 3.

*Type Material.* From the Barandella Shales, Hatton's Corner, Yass, N.S.W. Upper Silurian. University of Queensland collections.

*Material.* Three specimens, UNE F8725-6, UNE F8733, from which five transverse and four longitudinal sections were cut. Locality 451, Woolomin Beds.

*Diagnosis.* Polygonal corallites averaging 1.6 mm in diameter with walls periodically thickened ; septal spines most prominent in zones of thickening, where tabulae are crowded. Tabulae horizontal, usually 17 in a length of 5 mm, bearing tiny trabeculae on upper surfaces. Walls with a thin axial plane and perforated by two vertical rows of round mural pores near the centre of the faces.

*Description.* Corallites four to seven sided, usually hexagonal, of subequal diameters, averaging 1.6 mm but reaching 2.1 mm. Septal spines prominent, thorn-shaped, usually projecting upward, reaching 0.1 mm in length but usually 0.08 mm ; as many as 16 in some corallites, but more usually 10 in a cycle.

Wall thickness variable, from 0.06 up to 0.2 mm in narrow zones where walls are thickened ; usually at the same level in adjacent corallites. A thin, clear axial plane is usually seen. Mural pores arranged in two vertical rows in which pores are 0.25 mm apart, alternate or opposite ; circular, 0.15-0.2 mm in diameter.

Tabulae usually horizontal, occasionally gently concave or arched, frequently suspended from septal spines. Spacing of tabulae ranges between 17 and 22 in a length of 5 mm and is variable because of zones of crowding which correspond with the zones of wall thickening. In these zones the spacing of adjacent tabulae may be as close as 0.07 mm and tabulae are typically thickened. Tiny, pointed trabeculae, 0.04-0.09 mm high, project upwards from surface of tabulae, most commonly in the zones of crowding.

In longitudinal sections occasional zones are noted where the tabulae become incomplete, arched and inclined, forming a series in which tabulae rest on the upper surface of tabulae below.

*Remarks.* The present material differs from the type material in having larger corallites (up to 2.1 mm diameter) and pores arranged only in two rows down each corallite face. In thin sections cut from the type material examined by the writer, definite zones of crowding of the tabulae were seen, with the appearance of tiny, dark granules on the surface of some tabulae of similar appearance to the trabeculae described in the present material.

*Favosites allani* Jones, 1937

(Plate IIIi, j ; Fig. 5)

1937 *Favosites allani* Jones ; Jones, 1937 : 90, 91, Plate XII, figs 4, 5.

1940 *Favosites allani* Jones ; Hill and Jones, 1940 : 189-190, Plate V, figs 1a, b.

1962 *Favosites allani* Jones ; Philip, 1962 : 147-148 ; Plate XII, figs 5, 6.

*Type Material.* From Derrengullen Creek, Yass, N.S.W. Upper Silurian. University of Queensland collections.

*Material.* Ten specimens, UNE F8721-4 and UNE F8727-32, from which eight transverse and nine longitudinal sections were cut. Locality 451, Woolomin Beds.

*Diagnosis.* Corallites slender, 0.9-1.6 mm in diameter, polygonal, with mural pores occurring in one or two vertical rows down each corallite face. Septal spines short, prominent in areas of corallum showing thickening of walls; as many as 12 in one cycle. Tabulae generally horizontal, 16-23 in a length of 5 mm.

*Description.* Corallum massive, consisting of parallel corallites, with five to seven sides, usually six, ranging in diameter from 0.9 to 1.6 mm; corallite diameters fairly constant in one corallum. Walls vary considerably in thickness within a single corallum (0.06-0.12 mm) and a clear central line is sometimes visible. Mural pores, 0.15 to 0.2 mm in diameter, occur in one, or more usually two, rows down each corallite face.

Septal spines best developed in those zones with thickened walls; as many as 12 in one cycle, blunt, up to 0.12 mm long and extending up to one quarter the distance to the axis; one or two cycles between adjacent tabulae.

Tabulae horizontal or gently sagging, 16-23 in a length of 5 mm, evenly spaced, except for rare zones of crowding which are continuous through adjacent corallites.

*Remarks.* The present material agrees closely in general form and dimensions with the type material as described by Jones (1937). Notable thickening of the walls in parts of the corallum of this species had been noted previously by Hill and Jones (1940). The spines in the present material are shorter than those of the type material; some of the present specimens are completely lacking in spines, apparently due to recrystallization.

Family HALYSITIDAE Edwards and Haime, 1850

Subfamily HALYSITINAE Edwards and Haime, 1850

Genus ACANTHOHALYSITES Hamada, 1957

*Type Species.* *Halysites australis* Etheridge, 1898: 78; Plate XVII. SD, Hamada, 1957: 404.

*Diagnosis.* Halysitinae with septal spines in macrocorallites (Hamada, 1957: 404).

*Acanthohalysites pycnoblatoides* (Etheridge, 1904)

(Plate IVe, f; Fig. 7)

1904 *Halysites pycnoblatoides* Etheridge; Etheridge, 1904: 32; Plate IV, figs 1, 2; Plate VIII, figs 5, 6.

1955 *Halysites pycnoblatoides* Etheridge; Buehler, 1955: 54.

1957 *Acanthohalysites pycnoblatoides* (Etheridge); Hamada, 1957: 404.

*Type material.* The Australian Museum collection, from Bed c, Spring Creek, Portion 221, Ph. Barton, Co. Ashburnam, N.S.W. Holotype, Australian Museum F. 7616.

*Material.* Two specimens, UNE F11659 and UNE F11660 from which three transverse and three longitudinal sections were cut; from Locality 451, Woolomin Beds.

*Diagnosis.* Corallum of compact lacunae; dimorphic ranks consist of one or two large, oval macrocorallites with rectangular microcorallites occupying constrictions in the walls. Macrocorallites containing spines and with closely spaced tabulae.

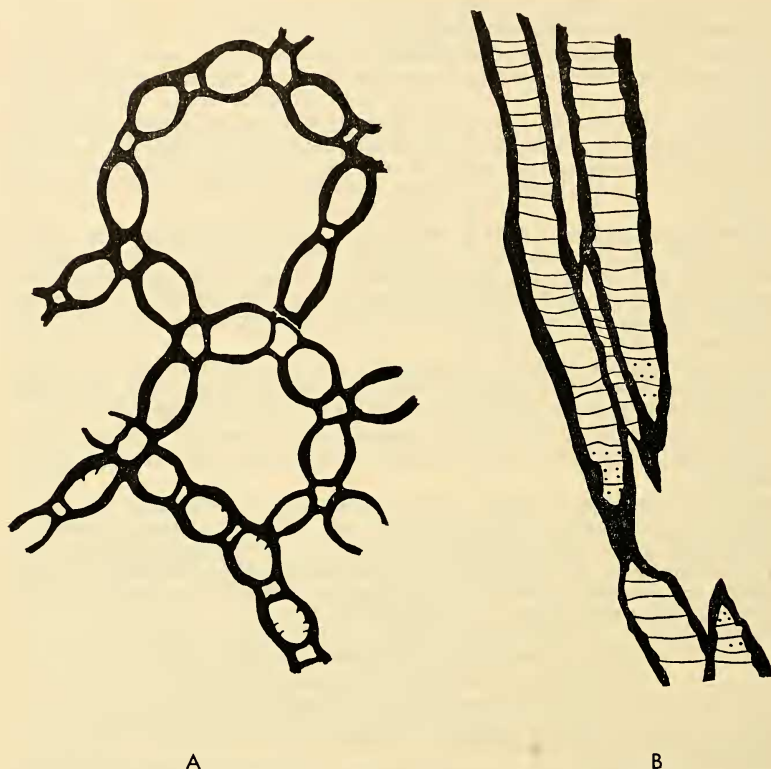


Fig. 7. *Acanthohalysites pycnoblastoides* (Etheridge).  $\times 5$ . (A) UNE F11659/1, transverse section; (B) UNE F11659/2, longitudinal section. From Locality 451, Woolomin Beds.

*Description.* Lacunae compact, polygonal (sizes  $3.7 \times 4.5$  mm,  $6.7 \times 8.5$  mm) or occasionally elongated ( $6.1 \times 3.2$  mm); ranks usually contain one or two macrocorallites, occasionally as many as four.

Macrocorallites range in cross-sectional form from oval ( $1.6 \times 1.0$  mm) to rounded ( $1.1 \times 1.0$  mm); chambers round to oval, with small, sharply pointed spines in vertical rows, usually two between adjacent tabulae. Walls 0.1 to 0.18 mm thick, strongly convex, ratio of widths at end of macrocorallite and at midlength respectively being 3 : 5, producing corrugated margins around lacunae.

Microcorallites occupy constrictions between macrocorallites, rectangular in cross-section, elongated transverse to ranks, averaging  $0.5 \times 0.2$  mm in size. Mesocorallites, 0.6 to 0.9 mm in diameter, present at the junction of ranks, variable in form from triangular and hexagonal to irregular. Tabulae in macrocorallites horizontal or sagging axially, evenly spaced, 15 or 16 in a length of 5 mm; tabulae in narrow microcorallites of similar spacing but often obscured.



*Remarks.* The present specimens agree very closely in general form and dimensions with the holotype as described by Etheridge (1904 : 32), differing only in having the tabulae of the macrocorallites more closely spaced. Smith (1965 : 250) records *A. cf. pycnoblatoïdes* from the Rosyth Limestone "Member" of the Panuara "Formation"; Hamada (1958 : 105) describes *A. pycnoblatoïdes yabei* from the Middle Gotlandian of Central China as a subspecies of the Australian species.

Genus HALYSITES Fischer von Waldheim, 1813

*Type Species* (by monotypy). *Tubipora catenularia* Linnaeus; Linnaeus, 1767 : 1270.

*Neotype.* *Halysites catenularis* (Linnaeus) Specimen no. 1 in Bromell collection in Palaeontologiska Institution, Uppsala, Sweden, described and figured by Bromell, 1728 : 411, no 5; fig. II on plate opposite 410 (chosen by Thomas and Smith, 1954).

*Diagnosis.* Halysitidae with microcorallites with complete tabulae and the absence of septal spines.

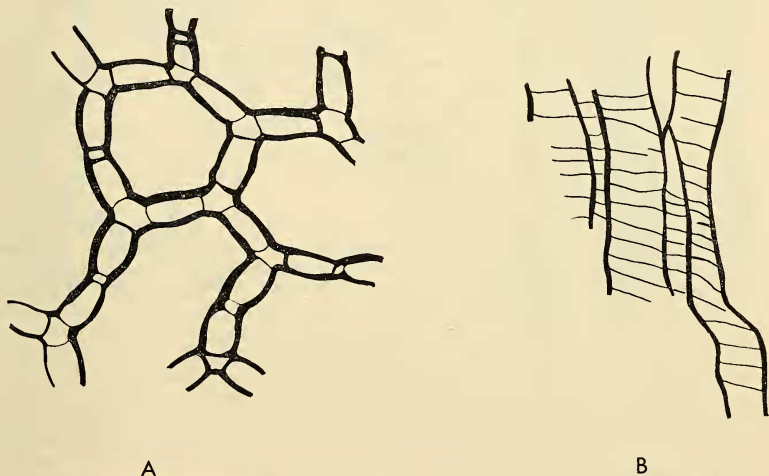


Fig. 8. *Halysites lithostrottonoides* Etheridge.  $\times 4$ . (A) UNE F11655/2, transverse section; (B) UNE F11655/3, longitudinal section. From Locality 841, lens 0, Woolomin Beds.

*Halysites lithostrottonoides* Etheridge, 1904  
(Plate IVg, h; Fig. 8)

1904 *Halysites lithostrottonoides* Etheridge; Etheridge, 1904 : 23; Plate I, fig. 1; Plate IV, Figs 1, 2; Plate IX, Fig. 4.

1920 *Halysites lithostrottonoides* Etheridge; Chapman, 1920 : 187.

1957 *Halysites lithostrottonoides* Etheridge; Hamada, 1957 : 402.

1961 *Halysites lithostrottonoides* Etheridge; Strusz, 1961 : 354; Plate XLIV, figs 8, 9.

*Type Material.* Australian Museum, F 77621, -23, -24; from Beds a and c, Spring Creek, Portions 98, 221 and 222, Ph. Barton, Co. Ashburnam, N.S.W.

*Material.* Five specimens, from which five transverse and four longitudinal sections were cut. UNE F11655-6 from lens 0, Locality 841; UNE F8744-6 from Locality 451; Woolomin Beds.

*Diagnosis.* Lacunae uniform, hexagonal, with smooth outlines. Ranks of one or two macrocorallites, with microcorallites elongated transverse to rank so that walls are not constricted. Tabulae horizontal and widely spaced.

*Description.* Lacunae typically hexagonal, compact, regular in size ( $4.4 \times 1.9$  mm;  $3.0 \times 2.0$  mm;  $4.0 \times 2.5$  mm;  $2.2 \times 2.2$  mm), formed by ranks consisting of a single macrocorallite, rarely two, and in one case six. Where ranks consist of two or more macrocorallites lacunae become elongated ( $6.3 \times 2.0$  mm).

Macrocorallites elongated, chambers with flat ends and only slight convexity of walls, so that ratio of width of corallite at the ends and midlength respectively is 5:6; size of macrocorallites ranges from  $1.0-1.2 \times 0.6-0.8$  mm. Septal spines absent. Microcorallites only present where rank contains more than a single macrocorallite; rectangular in cross-section ( $0.5 \times 0.15$  mm) with the longer diameter transverse to the length of the rank. Common walls with adjacent macrocorallites almost straight, thin. Mesocorallites hexagonal in cross-section;  $0.6-0.7$  mm in diameter; common walls with adjacent macrocorallites thin, convex towards mesocorallites, producing characteristic shape.

Tabulae thin, complete, horizontal or gently sagging axially and evenly spaced with 10 to 12 in a length of 5 mm; tabulae in microcorallites twice as closely spaced.

Two layers apparent in wall structure: a thin (0.05 mm wide) dark holotheca surrounds all parts of the ranks and within this is a clear peripheral stereozone, 0.1 mm thick, and also forming thin walls between macrocorallites and adjacent microcorallites or mesocorallites.

*Remarks.* The characteristic appearance of the elongate, smooth walled macrocorallites arranged in short ranks surrounding compact and regular lacunae easily distinguishes this species, named by Etheridge because of this appearance "remining one of a roughly-laid tessellated pavement" (1904: 23). Because the macrocorallites do not have markedly convex walls, and the walls are not constricted at the positions of the microcorallites, the sides of the lacunae are smooth and almost straight. In some specimens slight corrugation of the walls occurs because of a small increase in the convexity of the macrocorallite walls. Strusz (1961: 355) refers to a similar condition in a specimen from the Upper Ordovician or Lower Silurian of the Wellington district, N.S.W. Some of the present material contains macrocorallites which are larger but not so elongated as those of the holotype, and the ranks usually consist of only a single macrocorallite; Etheridge (1904: 24) notes similar variations.

*Halysites corrugatus* sp. nov.

(Plate IVi, j; Fig. 9)

*Name Derivation.* Latin *corrugatus* = wrinkled. A reference to the outline of the lacunae.

*Material.* Specimens UNE F11629-38 (holotype UNE F11638), from which two transverse and six longitudinal sections were cut; Locality 841, lens 0, Woolomin Beds.

*Diagnosis.* Large rounded or oval macrocorallites, up to 2.7 mm across, usually one or two per rank; septal spines absent. Small microcorallites occupy strongly re-entrant positions between macrocorallites. Lacunae compact with strongly corrugated margins.

*Description.* Lacunae compact, irregular in outline varying from triangular, square or rounded to elongated, with corrugated margins due to convex walls of macrocorallites. Size of lacunae  $3.0 \times 2.0$  mm,  $5.5 \times 4.0$  mm,  $7.0 \times 2.0$  mm, formed by ranks of one to four macrocorallites.

Macrocorallites oval to rounded in cross-section, averaging  $2.7 \times 1.9$  mm; chambers with rounded ends; septal spines absent. Walls strongly constricted at positions of microcorallites giving a ratio of diameters at the ends and midlength respectively of 5:9. Microcorallites square or rectangular with longer axis transverse to length of rank and averaging 0.5 mm. Mesocorallites at junctions of ranks typically rounded, 0.8 mm in diameter, but often elongated. Ranks frequently joined at the midlength of a macrocorallite, when the normal mesocorallite is replaced by a microcorallite.

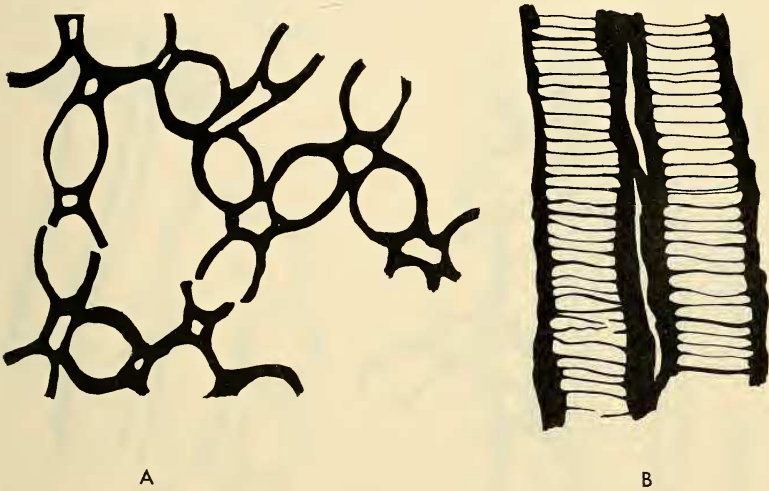


Fig. 9. *Halysites corrugatus* sp. nov.  $\times 3$ . (A) UNE F11638/1 (holotype), transverse section; (B) UNE F11638/5 (holotype), longitudinal section. From Locality 841, lens 0, Woolomin Beds.

Walls 0.3 mm thick, with a thin (0.1–0.15 mm), dark holotheca usually present but often not sharply distinguished from the inner layer of lighter coloured peripheral stereozone. Common walls between macrocorallites and adjacent microcorallites or mesocorallites 0.2–0.3 mm thick, usually curved and distinct from the layer of stereozone, having the appearance of balken.

Tabulae thin, straight, horizontal and complete, very evenly spaced at 12 to 14 in a length of 5 mm; tabulae in microcorallites similar in appearance but a little more closely spaced. In longitudinal sections microcorallites are often filled with crystalline calcite which obscures walls and tabulae.

*Remarks.* This species is distinguished by its large, round or oval macrocorallites and small microcorallites producing strongly corrugated walls bounding compact lacunae of variable cross-sectional form. Although microcorallites are always clearly seen in transverse sections, they frequently seem to be absent in longitudinal sections due to an infilling of recrystallized calcite.

*Halysites cratus* Etheridge, 1904

(Plate IVk, 1; Fig. 10)

1904 *Halysites cratus* Etheridge; Etheridge, 1904: 27-29; Plate I, fig. 1; Plate IV, figs 3, 4; Plate VI, figs 5, 6.

1925 *Halysites* cf. *cratus* Etheridge; Grabau, 1925: 77.

1955 *Halysites cratus* Etheridge; Buehler, 1955: 53-54.

1958 *Halysites cratus* Etheridge; Hamada, 1958: 101-102; Plate X, figs 5, 6a, 6b.

*Type Material.* Supposedly in the Mining and Geological Museum collection, Sydney; from Ph. Copper Hill and Ph. Gamboola, Co. Wellington, N.S.W.

*Material.* Two transverse and two longitudinal sections (UNE F8740-3) cut from material no longer extant; Locality 451, Woolomin Beds.

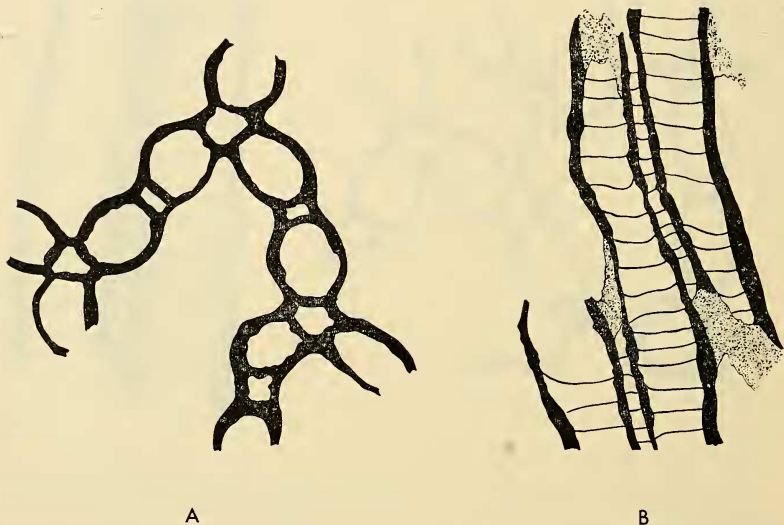


Fig. 10. *Halysites cratus* Etheridge.  $\times 5$ . (A) UNE F8740, transverse section; (B) UNE F8742, longitudinal section. From Locality 451, Woolomin Beds.

*Diagnosis.* Elongated lacunae bounded by ranks of two to five large, rounded macrocorallites, with strongly convex walls and small, rectangular microcorallites occupying marked constrictions between the macrocorallites.

*Description.* Lacunae compact, of variable form in cross-section: polygonal, slightly elongated, occasionally curved. Ranks composed of two to five macrocorallites forming lacunae with smoothly corrugated margins and ranging in size from  $8.2 \times 1.9$  mm to  $6.5 \times 3.8$  mm.

Macrocorallites oval to rounded, averaging  $1.2 \times 1.1$  mm in size, with smooth, strongly convex walls; chambers circular and lacking spines. The walls range in thickness between 0.15 and 0.25 mm with a thin, dark holotheca visible. The stereozone is composed of pale calcite, while the walls between macrocorallites and adjacent microcorallites or mesocorallites appear as short,



straight segments of almost clear calcite embedded in the stereozone and having the appearance of balken. Small, rectangular microcorallites, averaging  $0.2-0.3 \times 0.4$  mm in size and elongated transverse to the ranks, form marked constrictions between macrocorallites. Mesocorallites, ranging from triangular to hexagonal in cross-section and 0.6 mm in diameter, are situated at the junctions of ranks.

Tabulae in macrocorallites horizontal or gently depressed axially, evenly spaced at 14 to 16 in a length of 5 mm; tabulae in microcorallites more closely spaced, about 20 in a length of 5 mm.

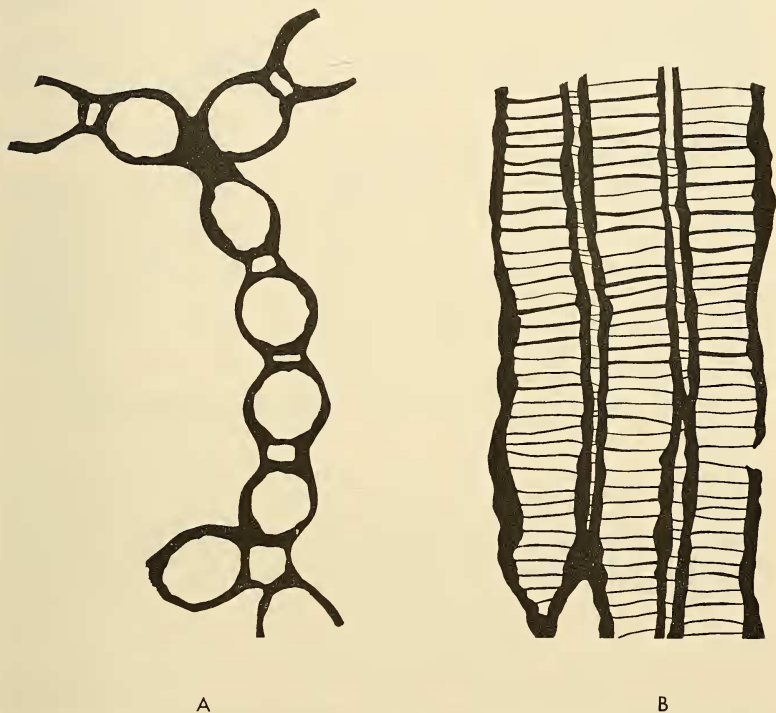


Fig. 11. *Halysites stronglyloides* sp. nov.  $\times 3$ . (A) UNE F11661/1 (holotype), transverse section; (B) UNE F11661/4 (holotype), longitudinal section. From Locality 451, Woolomin Beds.

*Remarks.* Etheridge, in his original description, emphasized the large size and rounded outline of the macrocorallites, the marked constrictions in the walls occupied by microcorallites and the long outline of many of the lacunae.

The present material closely resembles that described by Etheridge in appearance of the three types of corallites and the highly corrugated walls. However, the macrocorallites of the present species are smaller and the lacunae

generally more compact and regular. It must be noted that Etheridge's figures of the holotype (1904; Plate IV, figs 3, 4) show wide variation in the shape of the lacunae, ranging from linear to polygonal.

*Halysites strongyloides* sp. nov.

(Plate Va, b; Fig. 11)

*Name Derivation.* Greek *strongylos* = round; -oides = in the form of. A reference to the cross-sectional form of the macrocorallites.

*Material.* Two fragments of coralla, UNE F11661-2, the former designated holotype; two transverse and two longitudinal sections were cut. From Locality 451, Woolomin Beds.

*Diagnosis.* Lacunae elongate, narrow, with ranks of large circular macrocorallites with narrow slit-like microcorallites; mesocorallites at junctions of ranks triangular in cross-section. Tabulae evenly spaced, horizontal, 11 to 14 in a length of 5 mm.

*Description.* Lacunae long and narrow, e.g.  $16.0 \times 3.0$  mm,  $22.5 \times 3.5$  mm,  $10.3 \times 7.2$  mm; linear or curved in outline.

Ranks consist of two to five, usually three, large oval to rounded macrocorallites. Long diameter of macrocorallites ranges from 2.2 to 2.6 mm; short diameter from 2.2 to 2.3 mm. Chambers rounded, walls strongly convex, between 0.15 and 0.25 mm thick; inner surface of stereozone occasionally forms broad, rounded protrusions. Narrow, slit-like microcorallites, averaging  $0.3 \times 0.6$ – $0.8$  mm in size occupy marked constrictions between macrocorallites; in longitudinal sections these narrow chambers often obscured for the greater part of their length by recrystallization. Mesocorallites, 0.7–0.8 mm in diameter and triangular in cross-sectional form, present at the junctions of ranks although often obscured by recrystallization.

Tabulae in macrocorallites very evenly spaced and slightly thickened, horizontal, with 11 to 14 in a length of 5 mm; tabulae in the microcorallites twice as closely spaced.

*Remarks.* This species bears a superficial resemblance to *H. eratus* Etheridge in the form of the three types of corallites, strongly corrugated walls and general outline of the lacunae, but its overall dimensions are almost twice those of *H. eratus*. The protrusions of the stereozone into the chambers of the macrocorallites vary from broad, uneven undulations to occasional blunt, rounded ridges and are not interpreted as representing any form of septal apparatus.

*Halysites bellulus* Hamada, 1958

(Plate Vc, d; Fig. 12)

1958 *Halysites bellulus* Hamada; Hamada, 1958: 103–4; Plate X, figs 2–4.

*Type Material.* From the limestone of G<sub>3</sub> at Gion-yama (loc. 11), southwest Japan: holotype PCa 7276.

*Material.* Three specimens, UNE F11730-2, from which one transverse and two longitudinal sections were cut; from Locality 451, Woolomin Beds.

*Diagnosis.* Large, irregular lacunae ranging from compact to meandering. Macrocorallites oval, with elongated microcorallites occupying re-entrant positions between them. Triangular mesocorallites at the junctions of ranks. Tabulae evenly spaced, horizontal, 14 to 16 in a length of 5 mm.

*Description.* Lacunae of variable form in cross-section, ranging from polygonal to irregular, meandering forms; large e.g.,  $9.5 \times 2.5$  mm,  $6.0 \times 3.5$  mm,  $7.0 \times 2.0$  mm; ranks consist of two to seven macrocorallites.

Macrocorallites beautifully oval, averaging between 0.8 and 1.2 mm in length and from 0.5 to 0.6 mm maximum width. Walls of even thickness, averaging 0.08–0.1 mm; septal spines absent. Microcorallites always present, elongated transverse to the ranks, averaging  $0.3 \times 0.15$  mm in size. Mesocorallites at the junctions of ranks triangular in cross-section, 0.2 mm wide.

Tabulae in macrocorallites thin, horizontal and evenly spaced, there being 14 to 16 in a length of 5 mm; those in the microcorallites slightly more closely spaced.

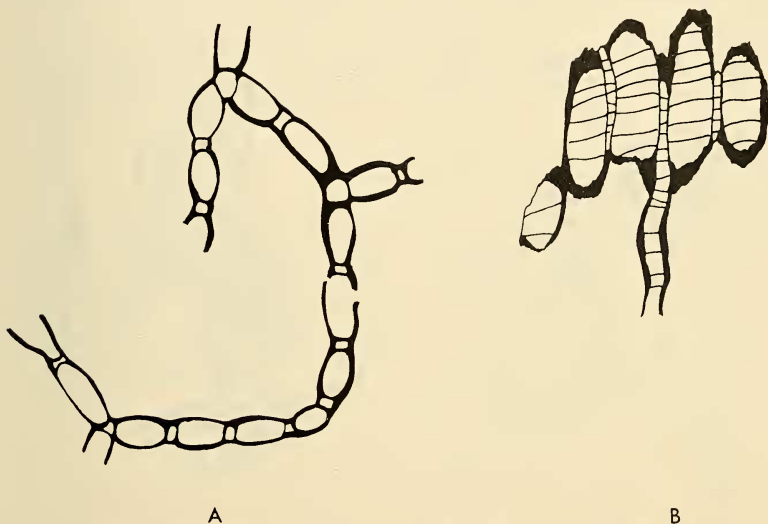


Fig. 12. *Halysites bellulus* Hamada.  $\times 8$ . (A) UNE F11730/1, transverse section; (B) UNE F11730/3, longitudinal section. From Locality 451, Woolomin, Beds.

**Remarks.** The present material fairly closely resembles that described by Hamada in the form of the three types of corallites, particularly the slender, oval macrocorallites, which Hamada emphasizes as characteristic for this species. In the present material the lacunae are a little larger than in the holotype, with higher numbers of macrocorallites in each rank, and with slightly more closely spaced tabulae.

*Halysites stellatus* sp. nov.  
(Plate Ve, f; Fig. 13)

**Name Derivation.** Latin *stellatus* = starry. A reference to the outline of the lacunae.

**Material.** Two pieces, UNE F11733, from which one transverse and one longitudinal section were cut. From Locality 451, Woolomin Beds.

**Diagnosis.** Compact lacunae of even size with corrugated margins, formed by ranks of a single, rarely two or three, oval macrocorallites; small microcorallites elongated transverse to rank present between macrocorallites; triangular mesocorallites at junction of ranks. Tabulae in macrocorallites gently arched and closely spaced.

*Description.* Lacunae compact and of even size,  $2.5 \times 1.2$  mm,  $2.0 \times 1.7$  mm,  $1.5 \times 1.1$  mm; usually one macrocorallite per rank, with strongly curved walls giving lacunae highly corrugated outlines; rarely two or three macrocorallites in a rank where lacunae become elongated, being up to 3.5 mm in length.

Macrocorallites average  $1.0 \times 1.7$  mm, with thin (0.08–0.1 mm) walls, which are strongly curved, giving macrocorallites an oval form in cross-section. Septal spines absent. Microcorallites small, their greater length being 0.1–0.15 mm and transverse to the rank. Mesocorallites at the junctions of ranks triangular in cross-section, 0.3 mm across; some of irregular form and elongated, being up to 0.5 mm long.

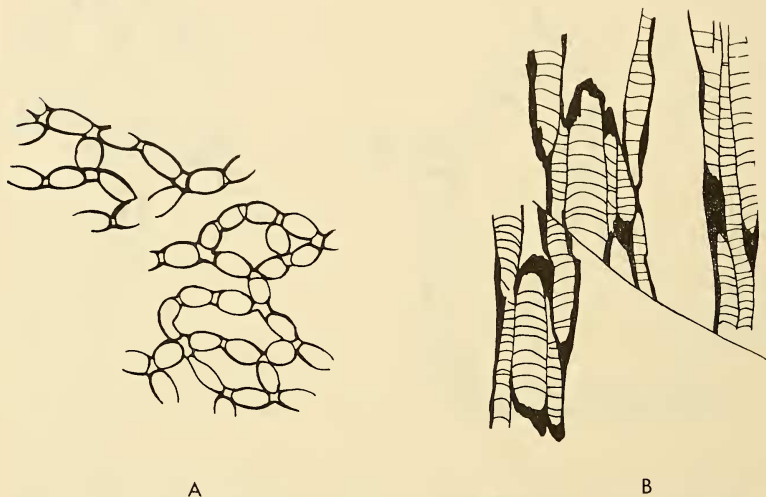


Fig. 13. *Halysites stellatus* sp. nov.  $\times 3.5$ . (A) UNE F11733/1 (holotype), transverse section; (B) UNE F11733/2 (holotype), longitudinal section. From Locality 451, Woolomin Beds.

Tabulae in macrocorallites thin, slightly arched upwards, regularly spaced, there being 14 to 18 in a length of 5 mm; those in mesocorallites horizontal and more closely spaced, with 20 in a length of 5 mm.

*Remarks.* This species is distinct from most other members of the genus because of the predominance of ranks containing only a single macrocorallite, giving the corallum an appearance similar to *Densoporites*, but the lacunae are much larger than individual macrocorallites and ranks containing two macrocorallites are relatively common.

#### Genus DENSOPORITES Hamada, 1957

*Type Species.* *Halysites compactus* Rominger; Rominger, 1876: 78–79; Plate XXIX, fig. 3; OD, Hamada, 1957: 405.

*Diagnosis.* “*Favosites*-like massive corallum with trigonal or tetragonal inter-spaces smaller than macrocorallites; mesocorallites are present” (Hamada, 1957: 404).



*Densoporites acanthodes* sp. nov.

(Plate Vh, i; Fig. 14)

**Name Derivation.** Greek *akanthodes*=thorny. A reference to the appearance of the septal spines.

**Material.** A single specimen, UNE F11663 (holotype), from which were cut three transverse and two longitudinal sections; from Locality 451, Woolomin Beds.

**Diagnosis.** Ranks of single corallites forming compact lacunae with corrugated margins; macrocorallites eye-shaped and containing long spines. Mesocorallites of irregular form present at junctions of ranks.

**Description.** Ranks consist of a single macrocorallite, resulting in regular, compact lacunae only a little larger than the macrocorallites; sizes  $1.9 \times 0.8$  mm;  $0.6 \times 0.9$  mm;  $1.7 \times 0.8$  mm; outlines scalloped because of strong convexity of macrocorallite walls.

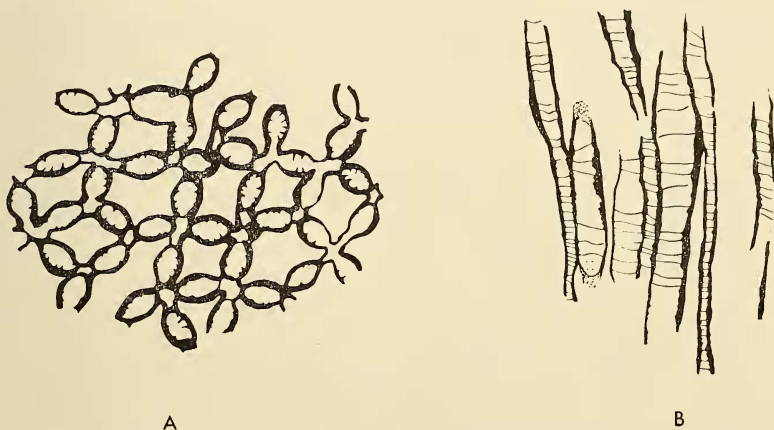


Fig. 14. *Densoporites acanthodes* sp. nov.  $\times 5$ . (A) UNE F11663/1 (holotype), transverse section; (B) UNE F11663/2 (holotype), longitudinal section. From Locality 451, Woolomin Beds.

Macrocorallites small, averaging  $0.7 \times 0.5$  mm, oval to elongated in cross-section; chambers with rounded ends. Walls variably thickened, up to 0.17 mm, but usually 0.1 mm thick. Septal spines common, up to 8 counted in each corallite; long, often extending almost to the axis, and thorn-like, having narrow bases. Tabulae in macrocorallites unevenly spaced, averaging 20 to 25 in a length of 5 mm; usually complete, horizontal; may be gently arched or depressed, occasionally incomplete.

Mesocorallites present at the junction of three or four macrocorallites; of extremely variable and irregular shape, depending on the number of macrocorallites at the junction, but always forming a marked constriction, averaging 0.2 mm, rarely 0.3 mm, in width.

**Remarks.** The single corallite per rank, small lacunae and abundant spines make this a distinctive species. One instance only of a rank containing two macrocorallites was seen, with a small, square microcorallite between them; one case of a rank joining at the midlength position of another macrocorallite

was also seen, with no intervening mesocorallite present. The present species differs from *D. brevicatenatus* (Hill) in having smaller and more elongated macrocorallites, more prominent spines and lacunae which are slightly larger than the macrocorallites.

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## EXPLANATION OF PLATES

T.S. and L.S. are abbreviations used throughout for transverse and longitudinal sections respectively.

## PLATE III

Figs a-c. *Mazaphyllum acclive* sp. nov. (a) UNE F8755 (holotype), T.S.,  $\times 4$ , showing general form of septa in several adjacent corallites ; (b) UNE F8756 (holotype), L.S.,  $\times 4$ , showing tabellae, inclined trabeculae and arched layers of dissepiments between tabularia ; (c) UNE F8755, T.S.,  $\times 10$ , part of fig. (a) enlarged to show individual trabeculae in septa. All from Locality 451, Woolomin Beds.

Figs d-e. *Plasmoporella* sp. cf. *P. convexotabulata* Kiaer. (d) UNE F8736, T.S.,  $\times 4$  ; (e) UNE F8734, L.S.,  $\times 8$ , showing arched tabulae and arched dissepiments in coenenchyme. Both from Locality 451, Woolomin Beds.

Figs f-h. *Favosites* sp. cf. *F. gassensis* Jones. (f) UNE F8726/1, T.S.,  $\times 4$ , showing zones with thickened walls, and pores ; (g) UNE F8733/2, L.S.,  $\times 4$ , showing rows of mural pores, zones with thickened walls and tiny projections on upper surface of tabulae ; (h) UNE F8733/2, L.S.,  $\times 10$ , an enlargement of part of fig. (g) to show details of projections on tabulae. Both from Locality 451, Woolomin Beds.

Figs i-j. *Favosites allani* Jones. (i) UNE F8727/6, T.S.,  $\times 12$ , showing septal spines and general form of corallites ; (j) UNE F8727/1,  $\times 12$ . Both from Locality 451, Woolomin Beds.

## PLATE IV

Figs *a-d*. *Laceripora dactylioides* sp. nov. (*a*) UNE F8748 (paratype 2), T.S.,  $\times 5$ , showing axial part of colony with thin walls and well developed septa and thickened peripheral zone of colony; (*b*) UNE F8751 (holotype), tangential section,  $\times 3$ , showing general features of colony; (*c*) UNE F8749,  $\times 3$ ; (*d*) UNE F8748 (paratype 2), L.S.,  $\times 5$ , showing tabulae and rapid branching of corallites. All from Locality 451, Woolomin Beds.

Figs *e-f*. *Acanthohalysites pycnoblatoïdes* Etheridge. (*e*) UNE F11660/2, T.S.,  $\times 4$ , showing general form of corallum with some faint septal spines; (*f*) UNE F11659/2, L.S.,  $\times 4$ , All from Locality 451, Woolomin Beds.

Figs *g-h*. *Halysites lithostrotonoides* Etheridge. (*g*) UNE F11655/2, T.S.,  $\times 3$ , showing general form of corallum with smooth-sided lacunae; (*h*) UNE F11655/1, L.S.,  $\times 6$ . Both from Locality 451, Woolomin Beds.

Figs *i-j*. *Halysites corrugatus* sp. nov. (*i*) UNE F11638/1 (holotype), T.S.,  $\times 2$ ; (*j*) UNE F11638/7 (holotype), L.S.,  $\times 4$ . Both from Locality 841, lens 0, Woolomin Beds.

Figs *k-l*. *Halysites cratus* Etheridge. (*k*) UNE F8741, T.S.,  $\times 4$ , showing general form of corallum. Note walls between macrocorallites and mesocorallites in top right hand corner having the appearance of balken; (*l*) UNE F8742, L.S.,  $\times 4$ . Both from Locality 451, Woolomin Beds.

## PLATE V

Figs *a-b*. *Halysites stronglyloides* sp. nov. (*a*) UNE F11661/1 (holotype), T.S.,  $\times 2$ , showing large round macrocorallites and slit-like microcorallites; (*b*) UNE F11661/4 (holotype), L.S.,  $\times 4$ . Both from Locality 451, Woolomin Beds.

Figs *c-d*. *Halysites bellulus* Hamada. (*c*) UNE F11730/1, T.S.,  $\times 4$ , showing large lacunae with long chains of slender, oval macrocorallites; (*d*) UNE F11730/3, L.S.,  $\times 10$ . Both from Locality 451, Woolomin Beds.

Figs *e-f*. *Halysites stellatus* sp. nov. (*e*) UNE F11733/1 (holotype), T.S.,  $\times 4$ , showing short chains of corallites producing characteristic outline of lacunae; (*f*) UNE F11733/2 (holotype), L.S.,  $\times 4$ . Both from Locality 451, Woolomin Beds.

Figs *g-i*. *Densoporites acanthodes* sp. nov. (*g*) UNE F11663/4 (holotype), L.S.,  $\times 10$ ; (*h*) UNE F11663/2 (holotype), T.S.,  $\times 12$ , an enlargement of part of fig. (*i*) to show septal spines; (*i*) UNE F11663/2 (holotype), T.S.,  $\times 4$ , showing general form of corallum. All from Locality 451, Woolomin Beds.